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Mars Pathfinder Landing Site Radar Properties

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Prior to Pathfinder's launch, much effort was invested to assess possible landing sites [1]. L-band radar observations were among the remote sensing data used to select the Ares Vallis site [2]. The observed radar parameters for wide regions of Chryse and Ares Vallis can now be examined in the context of Pathfinder's actual landing site morphology: the radar assessment of the Ares Vallis site was very successful. Radar provides three forms of information: ringing, reflectivity or cross-section, and roughness, the latter two being highly coupled. Delay-Doppler ranging found the elevation of the site with respect to the center of mass of the planet to be $R_p = 3389.60 \pm 0.05$ km, in agreement with ranging to the lander itself: 3389.73 ± 0.05 km [3]. How these numbers compare in detail depends on what elevation is being measured in the $10\text{ km} \times 156\text{ km}$ radar pixel. Rock statistics within 6 m of the lander applied to radar models produce good agreement with both the delay-Doppler and Doppler-only results (Delay-Doppler: $\theta_{rms} = 4.8^\circ \pm 1.0^\circ$ and $\rho = 0.057 \pm 0.015$ combined with measured rock-free fractional area $X = 0.839$, inserted into a quasi-specular cross-section model [4] suggest $\sigma_Q = 0.048$, while the Doppler-only result was $\sigma_Q = 0.045$.) Extrapolation from the landing site to the entire Chryse region remains an issue. These analyses reflect on both the usefulness and limitations of radar observations for understanding terrestrial planet surfaces.

[1] M. P. Golombek, R. A. Cook, H. J. Moore and J. Parker, *J. Geophys. Res.*, **102**, 3967 (1997).

[2] J. K. Harmon, *ibid.*, **102**, 4081 (1997); A. F. C. Haldemann, D. L. Mitchell, R. F. Jurgens, M. A. Slade and D. O. Muhleman, *ibid.*, **102**, 4097, (1997).

[3] Golombek et al., *Science*, in press (1997), Folkner et al., *ibid.*, (1997).

[4] W. W. Thompson and H. J. Moore, *Proc. Lunar Planet. Sci. Conf.*, **19**, **409**, (1989).